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DELIVERING INTEGRATED TRANSFORMATION FOR POWER AND WATER UTILITIES

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GROWTH OPPORTUNITIES IN THE MIDDLE EAST WATER SECTOR

INSIGHT PREPARED FOR WORLD UTILITIES CONGRESS BY:

FROST & SULLIVAN

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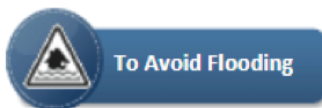
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CLIMATE CHANGE, WATER POLLUTION AND WATER STRESS, ALONGSIDE HIGH SCRUTINY AND REGULATORY PRESSURES ARE THE KEY GROWTH ENABLERS GLOBALLY

The water and wastewater (WWW) sector is transitioning, with state-of-the-art technology being developed and implemented across water utilities and industries. Water stress is most common in rapidly urbanizing centers across the world, and asset digitalization is gaining popularity as a key solution, which is expected to witness high investment in the coming years. Water assets equipped with advanced

digital technologies provide uninterrupted, safe, and cost-effective water supply services by optimizing operational and energy performance, which address the most critical issues concerning the water sector, such as the aging infrastructure, high operating costs, compliance costs, process control, asset quality, and service and plant efficiency.

WHY DO WE NEED DIGITAL TECHNOLOGIES?



To Avoid Flooding

- Real-time water level monitoring
- Predicting overflows



For Proper Water Management

- Integrated water management
- Water demand forecast



Water Resource Optimization

- Efficient water allocation along the distribution network
- Establishing long-term plans for optimal utilization



For Wastewater Treatment

- Water purification
- Wastewater reuse



Natural Disasters (Global):

According to the NOAA's National Centers for Environmental Information (NCEI), natural disasters due to climate change resulted in a loss of \$210 billion in CY 2020.

The United States – A Year of Record Damage due to Cyclones, Droughts, and Wildfires:

\$95 billion worth of losses in CY 2020

Midwest thunderstorm losses:

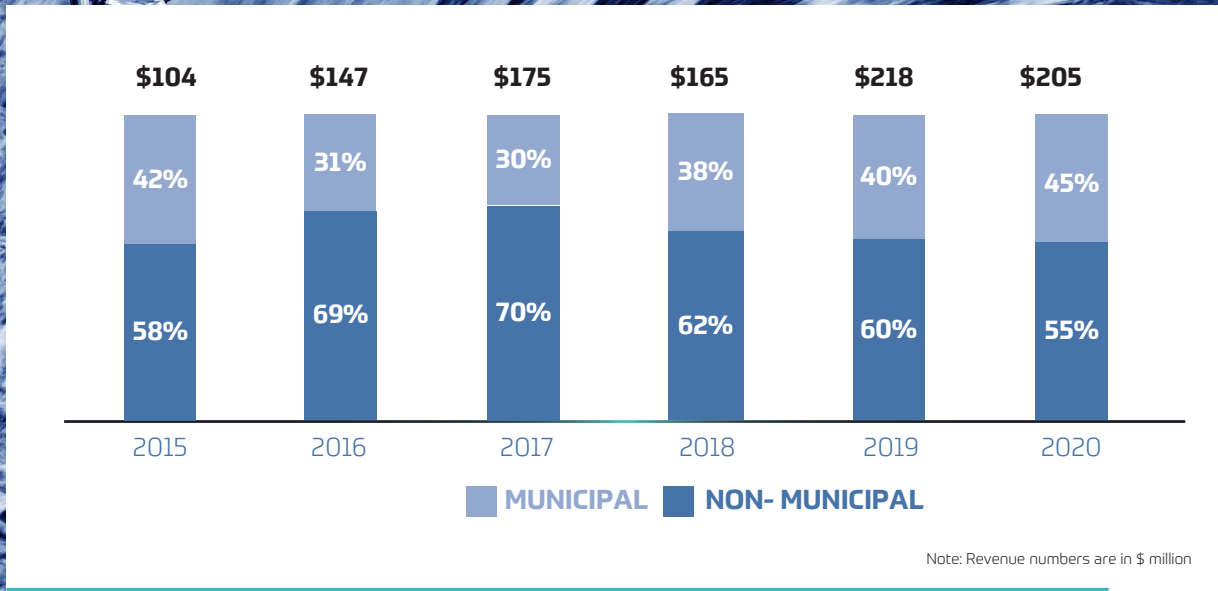
Severe thunderstorms in the Midwest resulted in a loss of \$40 billion in CY 2020.

Note: NOAA stands for National Oceanic and Atmospheric Administration
Source: NCEI and Frost & Sullivan

The COVID-19 pandemic highlighted the importance of resilient and future-ready water and wastewater infrastructure. Municipalities and industries across the globe are adopting net-zero, decarbonization, and circularity goals to become sustainable, resilient, and future-ready. Internet of things (IoT)-based solutions have become a vital cog in helping end users achieve

their net-zero targets. Utilities and industries significantly increased their investments in smart online sensors for asset monitoring and advanced artificial intelligence (AI)-based data analytics platforms to optimize the system in real-time. The focus is on reducing energy consumption and improving energy efficiency.

SMART WATER MANAGEMENT: WATER INVESTMENTS BY STAKEHOLDER TYPE, GLOBAL, 2015 - 2020



Source: UN World Water Development Report 2020 and Frost & Sullivan

End users are further focusing on the circularity of water and sludge. Nutrient and energy recovery from sludge has received fresh impetus, especially in the Asia Pacific (APAC) region. The European Union (EU) and North America (NA) are set to significantly invest in treating emerging pollutants, while treated wastewater reuse will be the major agenda in APAC, NA, Latin America (LATAM), and the Middle East.

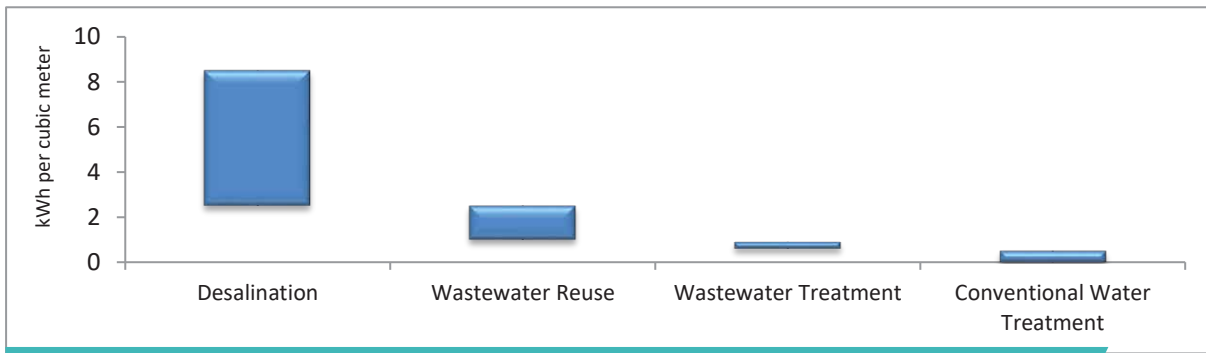
The Middle East and North Africa (MENA) region experiences extremely high levels of baseline water stress, according to the World Resources Institute report published in 2019. A total of 17 countries fall under this category, and 12 out of the 17 are in MENA. Qatar tops the list, followed by Kuwait and Saudi Arabia in the seventh and eighth positions, respectively. The United Arab Emirates, Bahrain and Oman also made the list. Given the current levels of water consumption and the anticipated growth in population and economic activities, the demand for water is expected to increase and water stress will worsen in the next 10 years.

Adding to this issue is the element of sustainability. Globally, utilities and industries are taking several measures to reduce their energy consumption, effectively use their material resources and reduce their carbon footprint across operations. Asset

digitalization has proven to be a major solution to achieving sustainability globally. The Middle East has yet to catch up, with low adoption of solutions targeting sustainability. In this context, a reliable alternative water supply source and addressing the growing requirement of sustainability are needed in the GCC. Services and solutions targeting desalination, wastewater recycling and digitalization are key growth opportunities in the Middle East region:

Desalination: Desalination technology has achieved a preferred status by allowing countries to tap into non-traditional water resources to provide a drought-proof supply of fresh water at large volumes and with high levels of efficiency. Many highly concentrated urban areas near coastlines have limitless access to ocean water, driving increased adoption of desalination technology. MENA accounts for about 47% of the global desalination capacity. Traditionally, desalination is a higher energy-consuming process than conventional water treatment methods. As a result, the growth of desalination plants in the GCC has seriously impacted its energy resources, creating a water-energy nexus.

UNIT ENERGY CONSUMPTION FOR DIFFERENT TREATMENT METHODS, THE GCC

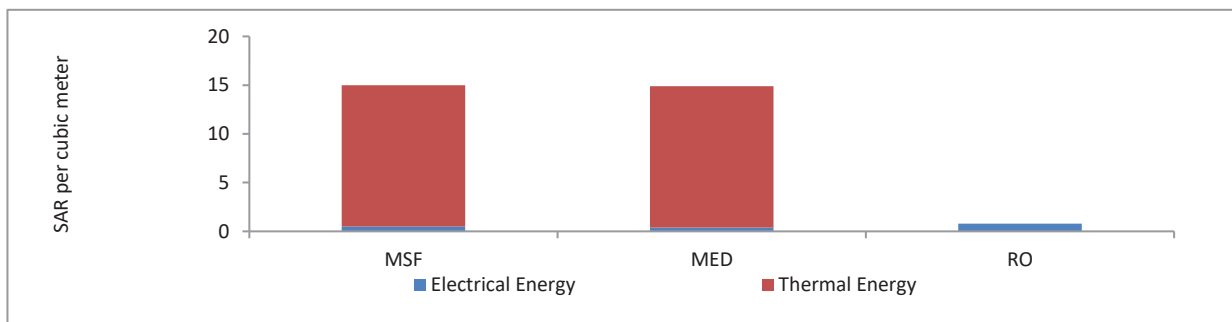


Source: IRENA and Frost & Sullivan Analysis

There are two broad categories of desalination technologies—thermal and membrane desalination. Thermal technologies are high energy consumers than membrane desalination, but are well-proven methods. During the launch of membrane technologies, the high CAPEX costs for this process hindered the penetration of membrane desalination. But innovations in pre-treatment, filter design and energy recovery have reduced high pre-treatment costs and energy consumption. These developments, combined with improvements in operational efficiency, have reduced the cost of desalination water by membrane technology. This led to the growth of reverse osmosis (RO) desalination systems in the GCC countries.

The shift from thermal to membranes processes is providing significant energy savings; however, the energy demand is forecast to grow in proportion to the high growth forecast for desalination plants in the GCC, thus making the water sector a high energy guzzler. The GCC countries are focusing on renewable energy technologies to promote demand-side energy management and as desalination would be the main water supply source despite sustainable measures such as wastewater recycling and reuse, energy efficiency measures and the use of renewables targeting desalination are imperative.

UNIT ENERGY COST COMPARISON, THE KSA



Source: IRENA and Frost & Sullivan Analysis

Desalination can be coupled with renewable sources such as solar, wind, etc., for energy efficiency. Solar energy is gaining popularity due to its abundant availability and is evenly spread over the entire region. The success of Masdar's Renewable Energy Desalination Pilot Program in Ghantoot is expected to speed up the commercialization of utility/large-scale projects. The Ghantoot pilot project achieved energy efficiency improvements of up to 75% through the four-year program compared to thermal desalination technologies in the UAE¹.

Global Clean Water Alliance is an international coalition of more than 80 members, including IRENA from the Middle East. The alliance aims to reduce carbon emissions from desalination by up to 270 metric tons annually before 2040². Such initiatives are creating growth opportunities for stakeholders across research & development, new products and solutions and new business models in the MENA.

¹ Masdar

² <https://saudigazette.com.sa/article/145900>

Digitalization: The Middle East region is also slowly exploring the benefits of water infrastructure digitalization. Several initiatives, such as the UAE's Water Security Strategy 2036, which aims to reduce water demand by 21% and increase the reuse of treated water by 95% by 2036, and the KSA's Qatrah initiative, which aims to cut daily per-capita water consumption by nearly half, from 263 liters in 2019 to 150 liters by 2030, are only expected to accelerate the adoption of digital solutions over the next 10 years. The immediate opportunities associated with the trend are smart water meters and smart sensors. The UAE is the biggest market today, and the KSA and Qatar have a high potential for growth in the coming years.

Inefficient water management methods have had adverse effects on water resources, and this has a significant economic impact that must be rectified immediately. Digital transformation in the water sector is a key path to achieving self-sufficiency and sustainability across utilities and industrial segments. This could also result in greater carbon footprint reductions, which is the critical issue today. The Middle East region is the global growth spot, driven by the country vision and commitments toward sustainability. This provides growth opportunities for all stakeholders across the water value chain.

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ABOUT WORLD UTILITIES CONGRESS

Hosted by TAQA and held under the patronage of HH. Sheikh Khaled Bin Mohamed Bin Zayed Al Nahyan, The World Utilities Congress will convene the global power and water industry to converge and discuss trends and technologies impacting future power and water demand. The focus will be on the proactive measures for decarbonisation, curbing carbon emissions and attracting the long-term capital investment needed for a sustainable future.

The event will be in-person taking place in Abu Dhabi from 8-10 May 2023.

The World Utilities Congress, hosted by TAQA, provides an unrivalled platform to explore the latest products, innovations and technological advancements across the global power and utilities landscape, bringing together water and power leaders to provide insights on building resilient low carbon business models with agile automated digital operations.

More than 120 regional & international exhibiting companies will be present, showcasing the latest technologies and solutions in power generation, transmission and distribution, nuclear energy, water management and desalination.

ABOUT FROST & SULLIVAAN

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